

**IN THE CLAIMS:**

1. (currently amended) A method for fabricating thin film oxides, the method comprising:  
forming a substrate;  
treating the substrate at temperatures equal to and less than 360° C, using a high density (HD) ~~inductively coupled plasma (ICP)~~ source; and,  
forming an M oxide layer overlying the substrate, where M is an element selected from a group including elements chemically defined as a solid and having an oxidation state in a range of +2 to +5, excluding silicon.

2. canceled

3. (currently amended) The method of claim 1 wherein forming a substrate includes forming a substrate including M; and,  
wherein using an HD plasma ~~[[ICP]]~~ source includes using an inductively coupled plasma (ICP) source for plasma oxidizing the substrate.

4. (original) The method of claim 3 wherein plasma oxidizing the substrate includes inductively coupling plasma:  
at a temperature of 360° C;  
in a range of 13.56 to 300 megahertz (MHz) with a power density up to 10 watts per square centimeter (W/cm<sup>2</sup>);  
at a pressure of up to 500 milliTorr (mTorr);

with a mixture of inert gas and oxygen in a ratio of approximately 10:1 to 200:1; and,

with a total gas flow of approximately 50 to 200 standard cubic centimeters per minute (sccm).

5. (original) The method of claim 4 wherein inductively coupling plasma includes varying a substrate bias in a range of 50 kilohertz (KHz) to 13.56 MHz with a power density up to 3 W/cm<sup>2</sup>.

6. (previously presented) The method of claim 4 wherein inductively coupling plasma with a mixture of inert gas and oxygen includes mixing oxygen with inert gas selected from the group consisting of helium, argon, and krypton.

7. (currently amended) The method of claim 4 wherein forming a substrate ~~including M~~ includes forming a silicon layer.

8. (currently amended) The method of claim 7 further comprising:  
forming a transparent substrate layer; and,  
forming a diffusion barrier overlying the transparent substrate layer and underlying the silicon layer;  
wherein forming a silicon layer includes forming transistor channel, source, and drain regions in the silicon layer;  
the method further comprising:  
depositing a thin film of element M overlying the silicon layer;

wherein forming an M oxide layer includes forming a gate dielectric layer of the oxide; and,

the method further comprising:

forming a gate electrode overlying the gate dielectric layer.

9. (original) The method of claim 8 wherein forming a gate dielectric layer of the oxide includes forming a dielectric layer with:  
a fixed oxide charge density of less than  $5 \times 10^{11}$  per square centimeter ( $/\text{cm}^2$ );

an interface trap concentration of approximately  $.9 \times 10^{10}$  to  $8 \times 10^{10}$  per square centimeter – electron volt ( $/\text{cm}^2 \text{ eV}$ );

a flat band voltage shift of less than 1 V;

a leakage current density lower than  $10^{-7}$  amperes per square centimeter ( $\text{A}/\text{cm}^2$ ) at an applied electric field of 8 megavolts per centimeter ( $\text{MV}/\text{cm}$ ); and,

a breakdown field strength greater than 10 MV/cm.

10. canceled

11. (original) The method of claim 3 wherein forming a substrate including M includes:

forming a base layer of a material; and,

depositing a thin film of element M overlying the base layer;

and,

wherein plasma oxidizing the substrate includes plasma oxidizing the thin film of M.

12. (currently amended) The method of claim 1 wherein using an HD plasma [[ICP]] source includes using an HD plasma enhanced chemical vapor deposition (HD-PECVD) process to treat the substrate; and,

wherein forming an M oxide layer overlying the substrate includes depositing the M oxide layer.

13. (original) The method of claim 12 wherein using an HD-PECVD process to treat the substrate includes inductively coupling plasma:

in a range of 13.56 to 300 MHz with a power density up to 10 W/cm<sup>2</sup>;

at a pressure of up to 500 mTorr; and,

with a mixture of reactive gases and precursor compounds having M in a decomposable form, the gases and precursor compounds in a ratio selected in accordance with the valence state of M.

14. (original) The method of claim 13 wherein inductively coupling plasma includes varying a substrate bias in a range of 50 KHz to 13.56 MHz with a power density up to 3 W/cm<sup>2</sup>.

15. (original) The method of claim 13 wherein forming a substrate includes forming a silicon layer.

16. canceled

17. (currently amended) The method of claim [[16]]  
15 further comprising:  
forming a transparent substrate layer; and,  
forming a diffusion barrier overlying the transparent  
substrate layer and underlying the silicon layer;  
wherein forming a silicon layer includes forming transistor  
channel, source, and drain regions in the silicon layer;  
wherein depositing the M oxide layer includes depositing a  
gate dielectric layer; and,  
the method further comprising:  
forming a gate electrode overlying the gate dielectric layer.

18. (original) The method of claim 17 wherein forming  
a gate dielectric layer includes forming a dielectric layer with:  
a fixed oxide charge density of less than  $5 \times 10^{11}/\text{cm}^2$ ;  
an interface trap concentration of approximately  $2 \times 10^{10}$  to  $8$   
 $\times 10^{10}/\text{cm}^2 \text{ eV}$ ;  
a flat band voltage shift of less than 1 V;  
a leakage current density lower than  $10^{-7} \text{ A/cm}^2$  at an applied  
electric field of 8 MV/cm; and,  
a breakdown field strength greater than 10 MV/cm.

19-20. canceled

21. (previously presented) The method of claim 1  
wherein forming, overlying the substrate, an M oxide layer includes

forming an M oxide selected from the group consisting of M binary oxides and M multi-component oxides.

22. (currently amended) The method of claim 1 wherein treating the substrate at temperatures equal to and less than 360° C using an HD plasma [[ICP]] source includes using a plasma source selected from the group consisting of electron cyclotron resonance (ECR) plasma sources and cathode-coupled plasma sources.

23. canceled

24. (currently amended) An in-situ method for fabricating thin film oxides, the method comprising:  
in a film processing chamber, forming a substrate;  
leaving the substrate in the film processing chamber,  
treating the substrate at temperatures equal to and less than 360° C,  
using a high density (HD) inductively coupled plasma (ICP) source; and,  
in the film processing chamber, forming, overlying the substrate, an M oxide layer where M is selected from a group including elements chemically defined as a solid and having an oxidation state in a range of +2 to +5, excluding silicon.

25. (new) The method of claim 1 wherein treating the substrate at temperatures equal to and less than 360° C, using a HD plasma source includes using a HD inductively coupled plasma (ICP) source.

26. (new) A method for fabricating thin film oxides, the method comprising:

forming a substrate;

treating the substrate using a high density (HD) plasma source; and,

forming an M oxide layer overlying the substrate, where M is an element selected from a group including elements chemically defined as a solid and having an oxidation state in a range of +2 to +5, excluding silicon.